WHAT IS CLAIMED IS:

1. A two-dimensional optical scanning apparatus comprising:

a rotating body; and

at least two linear light sources units disposed on a surface of the rotating body, comprising a plurality of lighting elements that are arranged in a row to emit red, green, and blue light that are modulated according to an image to be displayed.

2. The two-dimensional optical scanning apparatus as recited in claim 1, wherein the rotating body is in a shape of a cylindrical drum.

3. The two-dimensional optical scanning apparatus as recited in claim 2, wherein when the number of linear light source units is n, each linear light source unit is disposed at an angle of 360°/n with respect to an adjacent unit on the surface of the rotating body.

4. A two-dimensional optical scanning apparatus comprising:

a moving body that rotates endlessly; and

at least two linear light sources units disposed on the moving body, comprising a plurality of lighting elements that are arranged in a row to emit red, green, and blue light that are modulated according to an image to be displayed.

5. The two-dimensional optical scanning apparatus as recited in claim 4, wherein the moving body comprises:

at least two cylindrical drums; and

an endless belt or chain that is connected between the drums.

6. The two-dimensional optical scanning apparatus as recited in claim 5, wherein when the number of linear light source units is n and a length of the chain or belt is s, each linear light source unit is disposed at a distance s/n with respect to an adjacent unit on the belt or chain.

7. The two-dimensional optical scanning apparatus as recited in claim 4, wherein the apparatus has a linear section where the linear light source unit on the moving body is in rectilinear motion.

8. The two-dimensional optical scanning apparatus as recited in claim 1, wherein the linear light source unit is substantially parallel with a rotating axis of the rotating body.

9. The two-dimensional optical scanning apparatus as recited in claim 4, wherein the linear light source is substantially perpendicular to a moving direction of the moving body.

10. The two-dimensional optical scanning apparatus as recited in claim 1, further comprising a collimator lens for converting light from each lighting element of the light source unit into a substantially collimated light beam or a converging optical element for converting light from each lighting element into a converging light beam.

11. The two-dimensional optical scanning apparatus as recited in claim 4, further comprising a collimator lens for converting light from each lighting element of the light source unit into a substantially collimated light beam or a converging optical element for converting light from each lighting element into a converging light beam.

12. The two-dimensional optical scanning apparatus as recited in claim 10, wherein the collimator lens is selected from a small rod lens, a ball lens, a cylindrical lens, a toric lens, and a wedged prism which is attached to each lighting element of the linear light source.

13. The two-dimensional optical scanning apparatus as recited in claim 11, wherein the collimator lens is selected from a small rod lens, a ball lens, a cylindrical lens, a toric lens, and a wedged prism which is attached to each lighting element of the linear light source.

14. The two-dimensional optical scanning apparatus as recited in claim 1, wherein the collimator lens is selected from a small rod lens, a ball lens, a cylindrical lens, a toric lens, and a wedged prism which is attached to each lighting element of the linear light source.

15. The two-dimensional optical scanning apparatus as recited in claim 4, wherein each lighting element comprises a light emitting diode chip and an epoxy cast, the epoxy cast having a spherical or aspherical light emitting surface to function as a lens.

16. The two-dimensional optical scanning apparatus as recited in claim 1, wherein each lighting element is a light emitting diode of a surface emitter type, of which surfaces are coated by a metal film except for a predetermined area.

17. The two-dimensional optical scanning apparatus as recited in claim 4, wherein each lighting element is a light emitting diode of a surface emitter type, of which surfaces are coated by a metal film except for a predetermined area.

18. The two-dimensional optical scanning apparatus as recited in claim 1, wherein when a maximum scanning angle θ_{max} of the scanning unit is divided into a predetermined resolution, a time interval Δt during which the linear light source unit emits light between an i-th scanning angle θ_i and an (i+1)-th scanning angle θ_{i+1}

satisfies the following conditions:

$\tan\theta_{max} = k(\tan\theta_i - \tan\theta_{i+1})$ and

$\Delta t = (\theta_i - \theta_{i+1})/2\omega$,

where (2k+1) is a maximum line number of pixels;

θ_{i+1} is a scanning angle of an (i+1)-th line; and

ω is an angular velocity of the scanning unit.

19. The two-dimensional optical scanning apparatus as recited in claim 4, wherein when a maximum scanning angle θ_{max} of the scanning unit is divided into a predetermined resolution, a time interval Δt during which the linear light source unit emits light between an i-th scanning angle θ_i and an (i+1)-th scanning angle θ_{i+1} satisfies the following conditions:

$\tan\theta_{max} = k(\tan\theta_i - \tan\theta_{i+1})$ and

$\Delta t = (\theta_i - \theta_{i+1})/2\omega$,

where (2k+1) is a maximum line number of pixels;

θ_{i+1} is a scanning angle of an (i+1)-th line; and

ω is an angular velocity of the scanning unit.

20. An image display apparatus comprising:

a rotating body;

at least two linear light source units disposed on a surface of the rotating body, comprising a plurality of lighting elements that are arranged in a row to emit red, green, and blue light that are modulated according to an image to be displayed; and

at least one screen on which the scanned light beam is projected.

21. An image display apparatus comprising:

a moving body that rotates endlessly;

at least two linear light sources units disposed on the moving body, comprising a plurality of lighting elements that are arranged in a row to emit red, green, and blue light that are modulated according to an image to be displayed; and

at least one screen on which the scanned light beam is projected.

22. The image display apparatus as recited in claim 21, wherein the moving body comprises:

at least two cylindrical drums; and

an endless belt or chain that is connected between the drums.

23. The image display apparatus as recited in claim 21, wherein the apparatus

has a linear section where the linear light source unit on the moving body is in rectilinear motion.

24. The image display apparatus as recited in claim 20, wherein the number of screens is two or more, and each screen is displaced in a different direction from each other.

25. The image display apparatus as recited in claim 21, wherein the number of screens is two or more, and each screen is arranged in a different direction from each other.

AMENDED CLAIMS

received by the International Bureau on 25 February 2005 (25.02.2005);
claims 1 to 11, 15 to 16, 18 to25 unchanged ;Claims 12 to 14 and 17 cancelled.

WHAT IS CLAIMED IS:

1. A two-dimensional optical scanning apparatus comprising:

a rotating body; and

at least two linear light sources units disposed on a surface of the rotating body, comprising a plurality of lighting elements that are arranged in a row to emit red, green, and blue light that are modulated according to an image to be displayed.

2. The two-dimensional optical scanning apparatus as recited in claim 1, wherein the rotating body is in a shape of a cylindrical drum.

3. The two-dimensional optical scanning apparatus as recited in claim 2, wherein when the number of linear light source units is n, each linear light source unit is disposed at an angle of 360°/n with respect to an adjacent unit on the surface of the rotating body.

4. A two-dimensional optical scanning apparatus comprising:

a moving body that rotates endlessly; and

at least two linear light sources units disposed on the moving body, comprising a plurality of lighting elements that are arranged in a row to emit red, green, and blue light that are modulated according to an image to be displayed.

5. The two-dimensional optical scanning apparatus as recited in claim 4, wherein the moving body comprises:

at least two cylindrical drums; and

an endless belt or chain that is connected between the drums.

6. The two-dimensional optical scanning apparatus as recited in claim 5, wherein when the number of linear light source units is n and a length of the chain or belt is s, each linear light source unit is disposed at a distance s/n with respect to an adjacent unit on the belt or chain.

7. The two-dimensional optical scanning apparatus as recited in claim 4, wherein the apparatus has a linear section where the linear light source unit on the moving body is in rectilinear motion.

8. The two-dimensional optical scanning apparatus as recited in claim 1, wherein the linear light source unit is substantially parallel with a rotating axis of the rotating body.

9. The two-dimensional optical scanning apparatus as recited in claim 4,

wherein the linear light source is substantially perpendicular to a moving direction of the moving body.

10. The two-dimensional optical scanning apparatus as recited in claim 1, further comprising a collimator lens for converting light from each lighting element of the light source unit into a substantially collimated light beam or a converging optical element for converting light from each lighting element into a converging light beam.

11. The two-dimensional optical scanning apparatus as recited in claim 4, further comprising a collimator lens for converting light from each lighting element of the light source unit into a substantially collimated light beam or a converging optical element for converting light from each lighting element into a converging light beam.

12. (Canceled)

13. (Canceled)

14. (Canceled)

15. The two-dimensional optical scanning apparatus as recited in claim 4, wherein each lighting element comprises a light emitting diode chip and an epoxy cast, the epoxy cast having a spherical or aspherical light emitting surface to function as a lens.

16. The two-dimensional optical scanning apparatus as recited in claim 1, wherein each lighting element is a light emitting diode of a surface emitter type, of which surfaces are coated by a metal film except for a predetermined area.

17. (Canceled)

18. The two-dimensional optical scanning apparatus as recited in claim 1, wherein when a maximum scanning angle θ_{max} of the scanning unit is divided into a predetermined resolution, a time interval Δt during which the linear light source unit emits light between an i-th scanning angle θ_i and an (i+1)-th scanning angle θ_{i+1} satisfies the following conditions:

$$\tan\theta_{max} = k(\tan\theta_i - \tan\theta_{i+1}) \text{ and}$$

$$\Delta t = (\theta_i - \theta_{i+1})/2\omega,$$

where (2k+1) is a maximum line number of pixels;

θ_{i+1} is a scanning angle of an (i+1)-th line; and

ω is an angular velocity of the scanning unit.

19. The two-dimensional optical scanning apparatus as recited in claim 4,

wherein when a maximum scanning angle θ_{max} of the scanning unit is divided into a predetermined resolution, a time interval Δt during which the linear light source unit emits light between an i-th scanning angle θ_i and an (i+1)-th scanning angle θ_{i+1} satisfies the following conditions:

$$\tan\theta_{max} = k(\tan\theta_i - \tan\theta_{i+1}) \text{ and}$$

$$\Delta t = (\theta_i - \theta_{i+1})/2\omega,$$

where (2k+1) is a maximum line number of pixels;

θ_{i+1} is a scanning angle of an (i+1)-th line; and

ω is an angular velocity of the scanning unit.

20. An image display apparatus comprising:

a rotating body;

at least two linear light source units disposed on a surface of the rotating body, comprising a plurality of lighting elements that are arranged in a row to emit red, green, and blue light that are modulated according to an image to be displayed; and

at least one screen on which the scanned light beam is projected.

21. An image display apparatus comprising:

a moving body that rotates endlessly;

at least two linear light sources units disposed on the moving body, comprising a plurality of lighting elements that are arranged in a row to emit red, green, and blue light that are modulated according to an image to be displayed; and

at least one screen on which the scanned light beam is projected.

22. The image display apparatus as recited in claim 21, wherein the moving body comprises:

at least two cylindrical drums; and

an endless belt or chain that is connected between the drums.

23. The image display apparatus as recited in claim 21, wherein the apparatus has a linear section where the linear light source unit on the moving body is in rectilinear motion.

24. The image display apparatus as recited in claim 20, wherein the number of screens is two or more, and each screen is displaced in a different direction from each other.

25. The image display apparatus as recited in claim 21, wherein the number of screens is two or more, and each screen is arranged in a different direction from each other.

AMENDED SHEET (ARTICLE 19)